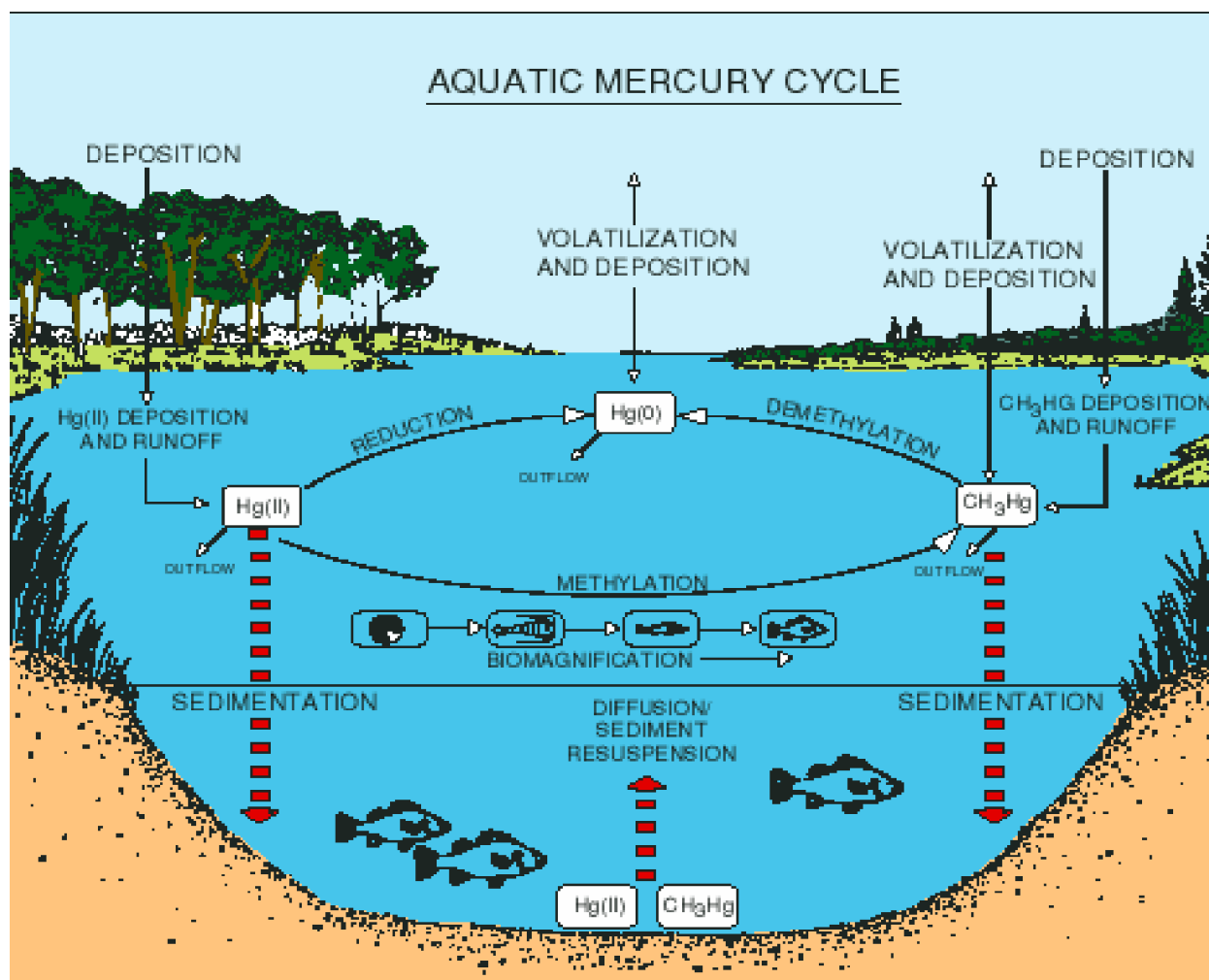


2.0 ORIGIN AND TRANSPORT OF MERCURY

Mercury is introduced into the environment through three principal processes. The first occurs naturally: mercury is emitted from volcanoes, the weathering of rocks, forest fires, and soils. In the second process, mercury is emitted as a result of human activities such as the burning of fossil fuels and municipal or medical waste. The third route is the re-introduction of mercury into the environment through natural processes such as evaporation of ocean water. **Figure 1** illustrates how mercury cycles through the aquatic environment.

Figure 1



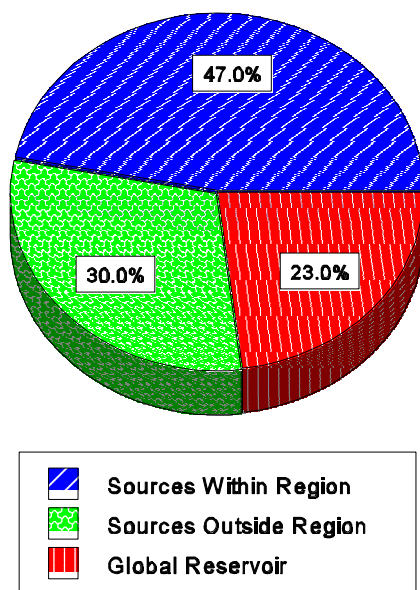
Once it is released into the atmosphere, mercury is deposited on the earth's surface by wet or dry deposition. Wet deposition occurs as a result of rain or snow storms. Dry deposition occurs as a result of wind storms and forest fires. Deposition of both types can occur in as little as 5-14 days after mercury is emitted to the air, or can take approximately one year -- during which time mercury can reside in the atmosphere and be transported far around the globe. The transport and deposition of mercury from anthropogenic sources is dependent upon release height (stack height), exhaust

conditions (temperature, velocity), mercury speciation (elemental or divalent) and form (vapor or particulate), other chemical pollutants emitted along with mercury, meteorological conditions and the chemical make-up of the airmass. Because of these many variables, current methods of evaluating mercury transport are not yet able to accurately link specific mercury sources to mercury concentrations in specific locations.

The U.S. Environmental Protection Agency's (EPA) *Mercury Study Report to Congress*, (December 1997) indicated that anthropogenic mercury emissions comprise 50-75% of all mercury released into the atmosphere in the United States. Mercury in New Hampshire is both emitted from New Hampshire sources and carried here from emission sources in upwind areas.

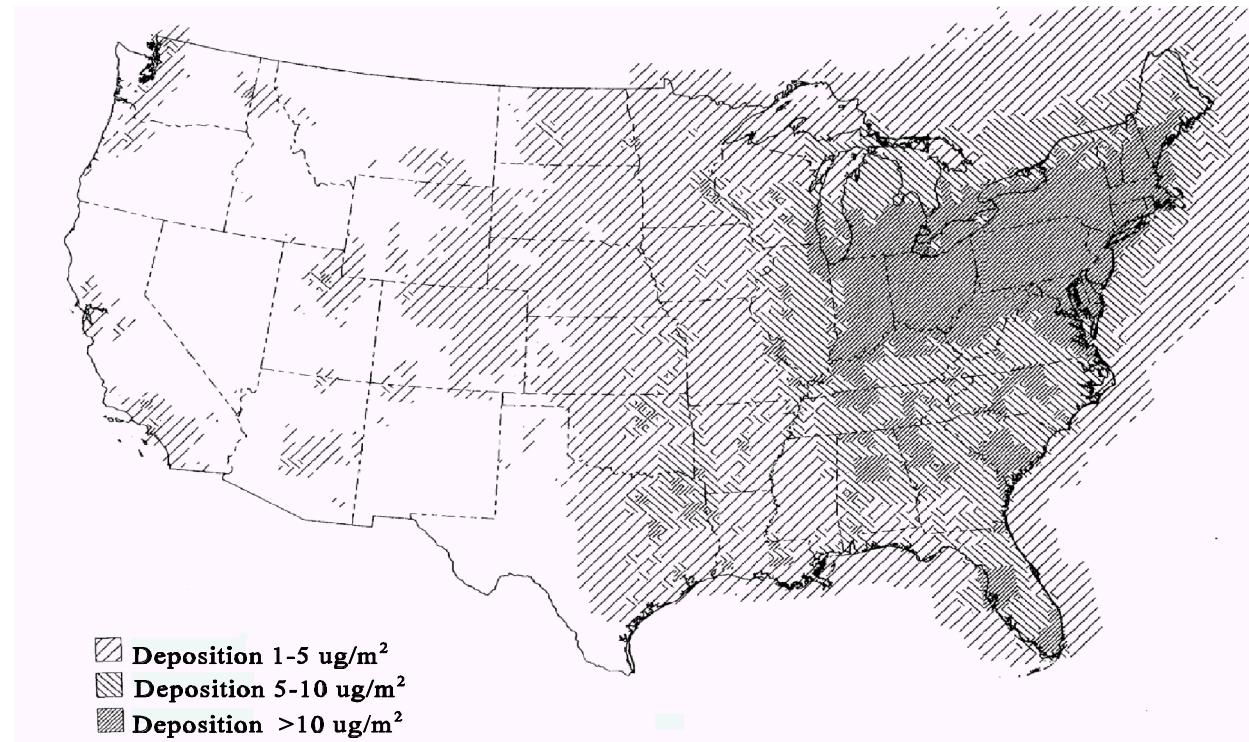
Recent estimates indicate that 47% of the mercury deposited in the Northeast originates from sources within the region, 30% from sources outside of the region, and 23% comes from the global mercury reservoir, which has been created over time from both natural and man-made sources (see **Figure 2**). Emissions upwind of New Hampshire are primarily attributable to coal-fired utilities and municipal and medical waste incinerators in the Northeast and Midwest. Studies show that mercury deposition rates in the Northeast are higher than in other areas of the country due to the combination of local emissions and transport from upwind sources. This is illustrated by **Figure 3** which is drawn from the *Mercury Study Report to Congress* and illustrates the total anthropogenic mercury deposition rates for the continental United States.

Figure 2
1998 Estimated Sources of Mercury Deposited in the Northeast



Source: Northeast States/Eastern Canadian Provinces Report on Mercury, 1998

Figure 3
Anthropogenic Mercury Deposition Rates in the United States



Many of the same sources that emit mercury also emit other harmful pollutants like oxides of sulfur and nitrogen, fine particulate matter, and other toxic compounds. Nitrogen oxides react with volatile organic compounds in the presence of heat and sunlight to produce ground-level ozone or smog. Sulfur dioxide is a major cause of the fine particulate matter that has been estimated to cause 60 deaths in New Hampshire each year (*Natural Resources Defense Council, 1996*). Sulfur and nitrogen oxide compounds released to the atmosphere are also converted to sulfuric and nitric acid, resulting in acid deposition and acid rain. Since these are serious environmental and public health problems in New Hampshire, DES has undertaken a number of initiatives, both voluntary and mandatory, to reduce emissions of all of these pollutants in the State. A summary of New Hampshire's mercury reduction efforts is contained in **Appendix 1**.

High mercury levels in fish sampled from remote lakes and ponds across New Hampshire, which are located far from any combustion sources, indicate that mercury is more than just a regional problem. Numerous scientific studies and computer simulations show that a significant amount of these pollutants originate outside of New Hampshire and are transported here by prevailing winds. Consequently, it is essential to secure reduction of these pollutants from upwind sources. New Hampshire believes that the most effective way to obtain these reductions is to lead by example. As a result, New Hampshire has chosen to take a leadership role by developing this strategy to reduce its own emissions of mercury. Individual states can make significant contributions to correcting the mercury contamination problem by reducing their own emissions and by calling for action on a national and international level.